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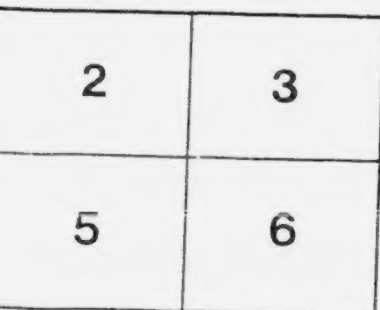
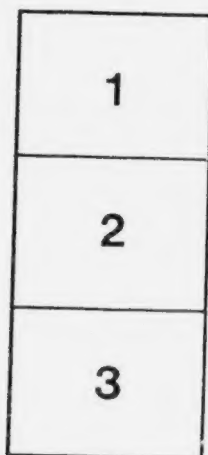
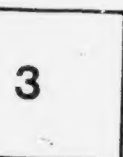
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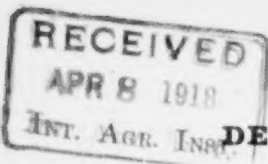
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CANADA.

DEPARTMENT OF AGRICULTURE
ENTOMOLOGICAL BRANCH.

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Crop Protection Leaflet No. 7.

RATS AND MICE.*

DESTROYERS OF GRAIN AND FOOD.

The brown rat is the worst pest with which man is afflicted. Both this rat and the house mouse came to North America from abroad; possessing habits adaptable to almost any kind of environment, and feeding upon all kinds of animal and vegetable matter they have increased and spread over a vast area. In Canada they have not yet spread over the greater portion of the prairie provinces, but in their gradual migration from the east they have now spread over southern Manitoba, and as the west becomes more settled their destructive hordes will certainly extend further afield, menacing especially the grain interests.

Destruction of Food.—Their destructive powers are well known. No kind of grain is spared, whether growing or stacked in the field, stored in the granary or elevator, transported by rail or water; everywhere they take an enormous toll of this chief source of our food supplies, the conservation of which is a paramount necessity at the present time. Never have the destructive powers of mice been so strikingly demonstrated as in Australia during 1917. Owing to the lack of transportation, vast quantities of grain destined for export have accumulated in New South Wales and Victoria. A plague of mice developed, and the destruction of grain has been enormous. We are informed that in some places the ravages of the mice were so great that huge stacks of grain were reduced to what resembled mere heaps of debris in a few months. The Wheat Board of New South Wales organized a campaign of destruction; in one place the catch for two nights totalled seven tons of mice. While this outbreak was exceptional, it serves to show the destructive powers of these small creatures, in the mass.

The brown rat invades houses, stores, warehouses, and markets, and besides destroying fabrics of all kinds and leather goods, it attacks all kinds of food: meats, groceries, fruits, vegetables. In town and country it attacks poultry, destroying eggs and chickens. The foundations of buildings are damaged by their activities, and everywhere they destroy unceasingly, and yet we tolerate their presence.

In Europe it was estimated, after a full inquiry in 1907, that the average annual loss caused by each rat in Great Britain equalled \$1.80, in France \$1, and in Denmark \$1.20. The losses in rural districts in Great Britain and Ireland in the same year were computed to be seventy-three million dollars, and a capital of about ten million dollars was employed in the industry of supplying means for their destruction. In 1904 the losses in France were computed at forty million dollars. At the present time the English Board of Agriculture is making special efforts to combat the rat pest in England as a means of saving food supplies, and the Sanitary League in France is also carrying on a vigorous campaign against rats.

Recently, Mr. E. W. Nelson, Chief of the Biological Survey of the United States Department of Agriculture, has estimated that the annual losses in the United States

* By C. Gordon Hewitt.
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due to rats equal at least 200 million dollars. He also states that in order to feed and otherwise provide for this enormous destructive army of rats, the labour of 200,000 men is required annually.

Menace to Health.—Besides the enormous destruction of food supplies, the brown rat is a serious menace to public health. It is a carrier of bubonic plague, one of the most devastating of human diseases, which has been carried by the rat all over the world. In the fourteenth century it is estimated that about twenty-five million people died in Europe from the "Black Death," as this disease was called, and 2,000,000 deaths are stated to have occurred during the epidemic of the plague in India in 1907. Bubonic plague is transmitted from rats to human beings by fleas, and modern methods of preventing the spread of plague involve the most vigorous eradication of rats, and the prevention of their landing in seaports from ocean-going vessels by which they are transported.

Investigations into the recent outbreak of infantile paralysis (*Poliomyelitis*), which was especially prevalent in the eastern United States, have indicated that the rat may be an important factor in the spread of this disease.

Prolific Habits.—The serious nature of the rat menace is more keenly appreciated when their prolific habits are realized. The brown rat begins to breed when it is about three or four months old; they breed from six to ten times a year, and produce, on the average, ten young in a litter. If we imagine a pair of rats breeding at this rate uninterruptedly for three years without any deaths to their progeny, at the end of that period the number would have increased from two to over 350 million rats.

Mice produce fewer young in a litter, but they bring forth their families with astonishing rapidity.

HOW TO PROTECT GRAIN, FOOD, AND OTHER STORED PRODUCTS FROM RATS AND MICE.

The main reason for the abundance and destructiveness of rats is that we provide ample food and shelter for them. To combat these pests successfully we must deny them both these essentials. We must starve them out and build them out.

They should be denied access to places where they obtain food and rear their young. To accomplish this, buildings should be made rat-proof; and the best method of construction for this purpose is concrete. In the construction and maintenance of buildings in which food is kept and rats are likely to find lodgment, special attention should be paid to the closing of all apertures, especially in foundations where drain and other pipes enter. Doors to such buildings should be bound with strong sheet metal. Constant vigilance should be exercised with a view to checking any inroads of these pests; the holes of rats or mice can be readily stopped by a little concrete or broken glass or crockery. Cement should be used for foundations of all kinds of storehouses, granaries, poultry houses. Corn cribs can be rendered ratproof by inclosing them in heavy galvanized wire netting of half-inch mesh. Storerooms should always be made ratproof by the adoption of the foregoing structural methods.

So long as old buildings and storerooms are maintained in a state of disrepair, rats and mice will flourish and destroy their contents. It is not only in the interests of private economy, but as a national service, that owners of such rat-infested buildings should take immediate steps to "build out" the rats and save food supplies. Everywhere destruction is proceeding, and everywhere there is greater need than ever at the present time for the saving of every bushel of grain and every pound of food.

Civic authorities, and particularly the health authorities, should adopt and enforce sanitary conditions in towns and cities. Cleanliness and the prevention of the accumulation of refuse and garbage are essential in the eradication of rats. The maintenance of garbage dumps is one of the greatest contributing causes

to the abundance of rats. From all points of view the immediate incineration of garbage is the only proper treatment and method of preventing the increase of rats and the breeding of flies, those unsurpassed agents in the spread of our worst infectious diseases.

HOW TO DESTROY RATS AND MICE.

Trapping.—One of the most effective methods of destroying these pests is trapping. The best traps are those of the spring or guillotine type. Such traps may be baited with any of the baits preferred by these animals, such as meat, oatmeal, cooked eggs, or fruit. It is necessary to use a large number of traps, the more the better. The wire cage traps are excellent when rats are abundant.

Poisoning.—Where there is no danger of food becoming contaminated, or of other animals eating the bait, poisoning is a speedy method of destruction. But naturally the greatest care must be exercised in the use of poison. In destroying rats and mice in houses it is inadvisable to use poison, not only on account of its danger, but the occurrence of the inaccessible corpses of these animals is likely to prove objectionable. *Barium carbonate* is a cheap, tasteless, and odourless poison. It may be mixed in a dough composed of four parts of meal or flour and one part of the poison, or a stiff dough of eight parts of oatmeal and one of poison.* The poisoned dough should be placed in the runways of the animals. *Strychnine* is a well-known and rapid poison, usually used in the form of strychnia sulphate. The dry crystals of this chemical are inserted in baits, such as meat or cheese. With oatmeal or grain, such as wheat or corn, it is used in the form of a syrup which is made by dissolving half an ounce of strychnia sulphate in a pint of boiling water; a pint of thick syrup is added, and the whole mixture is stirred thoroughly. Oatmeal should be moistened with the syrup, and grain should be soaked over night. *Arsenic* is used in most rat poisons. It may be fed in the form of powdered white arsenic, used as described above. A good bait is prepared by thoroughly mixing a pound of oatmeal, a pound of coarse brown sugar, and a spoonful of arsenic. This is placed in the runs of the animals. *Phosphorus* is a common ingredient of rat and other animal poisons, but owing to the danger involved in mixing it and in the subsequent use of the home-made or commercial preparations on account of its very great inflammability, its use as a rodent poison is not recommended.

The value of domestic and wild animals as rat destroyers.—The great value of small terriers as rat-catchers is too well known to need emphasis. They are often used in conjunction with ferrets, the latter animals being employed to drive the rats from their runways. But ferrets should always be muzzled when hunting.

While weasels are regarded as "vermin" and enemies of chickens and young game birds, there is no doubt that as rat destroyers they have few superiors. When they can secure rats they will usually leave the chickens unmolested.

Among the active natural enemies of rats and mice around farm buildings, snakes occupy an important place, and this fact should be realized. Only one species of Canadian snake—the rattlesnake—is poisonous; our other native snakes are not only harmless but are useful as destroyers of rats, mice, and other pests, and they should therefore be protected.

In country districts, farmers should protect owls, the greatest of mice destroyers; and many of the hawks are valuable as destroyers of noxious rodents. The continued destruction of these natural enemies of rats, gophers, and mice has been largely responsible for the increase in the numbers of these food-destroying rodents, and it is important that the valuable services of these birds should be recognized.

*The methods of preparing these poisoned baits are those recommended by the Biological Survey of the United States Department of Agriculture.

Organized Destruction.—In England excellent results have been obtained by the co-operative efforts of farmers and others in the destruction of rats, and such organized destruction is essential if results of real value are to be obtained. The offer of prizes and bounties by local authorities has been found to stimulate effort. In many cities and towns the local authorities and organizations have promoted rat destruction, and it has been successfully stimulated by educational work.

We would urge the various organizations in cities and towns, and farmers' and women's institutes in rural districts, to undertake educational work with a view to arousing public opinion as to the serious losses caused by these pests, and to promoting campaigns for their destruction.

Rats and mice are destroying millions of dollars' worth of food in Canada at the present time, when the conservation of food is a duty that devolves upon every one. The more food we permit the rats to destroy the less there is for us and our kinsfolk across the sea to eat. Never was the need of saving food supplies a greater necessity; never was the need of the most relentless campaign against these food destroyers. Eradicative measures should be prosecuted with the greatest vigour wherever these pests occur, whether on the farm or in the city.

February 25, 1918.

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